

INVESTIGATION OF BITUMINOUS SANDS IN NORTHERN ALBERTA

By S. V. Ells*

Since the advent of the fur traders during the eighteenth century, deposits of bituminous sand (heretofore referred to as "tar sand") have been recognized in Northern Alberta. These deposits are probably the largest of the kind in the world, yet, until recently, practically nothing has been known regarding their true economic importance.

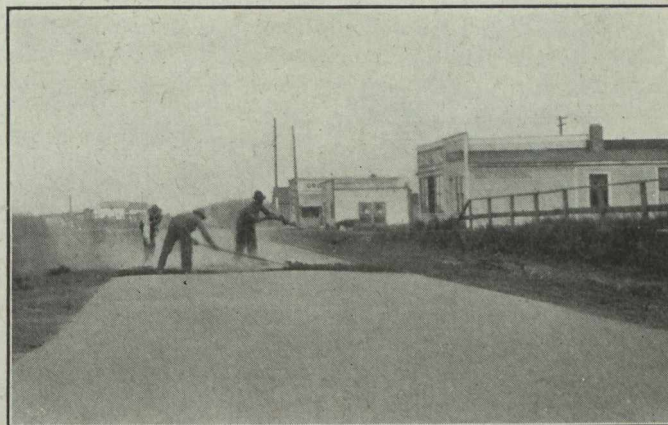
In 1913 a brief reconnaissance of the deposits was made, during which upwards of two hundred and fifty individual outcrops were measured, and over 100 samples secured.

Following this preliminary examination, the writer suggested that a section of experimental pavement be laid. It was felt that such a pavement would illustrate in a practical manner the value that should attach to the Alberta deposits as a possible source of a suitable paving material. During 1914, a quantity of the bituminous sand was, therefore, mined and shipped to Edmonton. During the past season, this material was laid as a pavement in Edmonton. This pavement comprised sections

sheet asphalt mix, the resulting aggregate was further modified by the addition of clean and graded sand; in the case of the bitulithic mix, by the addition of clean sand and graded crushed gravel. In the case of the bituminous concrete, fine grained bituminous sand only was used, and was modified by the addition of graded crushed gravel and of clean sand. This manipulation also reduced the somewhat high percentage of asphalt cement present in the original material to the final percentage desired in each case.

In heating and mixing the materials, a heated rotary mixer was used. This mixer consists essentially of a revolving, jacketed drum, set on trunnions above a fire-box, and connected to the engine by shafting and gears. The inner surface of the mixer drum is fitted with baffles so arranged that a thorough mixing of charged materials is assured. Convenient charging and dumping facilities are provided.

In actual operation, and prior to charging, the drum was



Experimental pavement at Edmonton, laid under direction of S. V. Ells, of the Mines Branch, to demonstrate use of Alberta's bituminous sand deposits.

of three types of surfacing, viz., sheet asphalt, bitulithic and bituminous concrete.

As a site for this pavement, a section of Kinnaird Street, immediately south of Alberta Avenue, was selected. The traffic along this part of Kinnaird Street is such as will give a pavement a fairly severe test, and may be classed as heavy. Apart from a considerable volume of fast automobile travel, it includes vehicles which carry loads up to eight and ten tons.

Deposits of bituminous sand in Northern Alberta may be grouped in two classes, viz.:—(1) Deposits in which bitumen is combined with a coarse mineral aggregate; (2) Deposits in which bitumen is combined with a fine mineral aggregate.

The trial shipment used in the construction of the Edmonton pavement comprised both fine grained and coarse grained varieties, and, from a consideration of analyses of the crude material, three outstanding features were at once apparent:—(1) High penetration of asphalt cement; (2) Unbalanced mineral aggregates; (3) Excess of asphalt cement, (15%).

The effect of unduly high penetration was modified by partial distillation of the more volatile fractions. The unbalanced aggregates of coarse and fine bituminous sand were partially corrected by combining the two in a proportion of two of fine to one of coarse. In the case of the

usually preheated to a temperature of 250°-300° F. The bituminous sand was then wheeled in barrows to the loading platform, and the drum charged. During the first period of heating, the drum was kept closed by means of a damper. When, however, the bituminous sand had reached the desired temperature (400°-410° F) the heat was turned off, and the damper removed. The mix was then allowed to remain in the drum for a further period of 8 to 10 minutes, during which time the lighter hydrocarbons passed off freely as vapor.

Analyses of samples of the finished pavement indicate some room for improvement in the balancing of the mineral aggregate. In this respect, however, there should be no real difficulty in making desired modifications. The penetration of the asphalt cement is high. With a properly balanced aggregate this does not necessarily indicate a source of weakness.

The wearing surface mixture reached the street at an average temperature of 325° F., though the temperature of occasional loads was 350° F. It was immediately spread on the 6" concrete base with hot shovels and hot rakes.

Owing to the somewhat light nature of the contained asphalt cement, it was found necessary to exercise care in rolling. The best results were obtained by first rolling with a light (15 lbs. per linear inch width of tire) hand

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